

REMARKS

Applicant respectfully requests reconsideration and allowance of the subject application. Claims 2-12, 14-19, 21, and 23-24 are pending, of which claims 2, and 12 have been amended.

ALLOWABLE SUBJECT MATTER

Claims 11, 16-19, 21, 23, and 24 are indicated as being allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claim. Applicant appreciates the indication of allowability.

35 U.S.C. §103 CLAIM REJECTIONS

The Examiner has rejected claims 2, 3, 5, 7-10, 12, 14, and 15 as being unpatentable over U.S. Patent No. 6,396,362 to Maurant, et al. (hereinafter "Maurant") in view of U.S. Patent No. 5,214,796 to Gorrie, et al. (hereinafter "Gorrie"). Applicant respectfully traverses these rejections.

The Claimed Invention

The claimed invention provides a novel quadrature hybrid and an improved vector modulator circuit incorporating the novel quadrature hybrid. The quadrature hybrid taught in the claimed invention provides signal coupling and ninety degree phase shifting without the need for discrete inductors and capacitors. The claimed invention accomplishes this feat by using a first spiral inductor and a second spiral inductor parasitically coupled across a dielectric layer to create intrinsic capacitance and thus eliminate the need for discrete capacitors in the quadrature hybrid. The small size and design parameters of the quadrature hybrid allow the complete vector modulator circuit including to be formed on a monolithic microwave integrated circuit (MMIC).

Maurant

Maurant teaches a radio frequency BALUN transformer using substantially flat primary and secondary conductive loops configured in spiral patterns. One loop is disposed

in a single vertical plane, while the second loop is disposed in two different vertical planes, with one of the planes being the same vertical plane that contains the first loop. This configuration allows the parasitic capacitances between the first loop and the second loop to be reduced.

Gorrie

Gorrie teaches an improved method for an image separation mixer. The image separation mixer taught in Gorrie uses phase shifter and mixer means to separate intermediate frequency (IF) components of the same frequency from an RF signal that comprises different RF frequencies.

The Examiner has not set forth a prima facie case of obviousness

As set forth in the MPEP:

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combined reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. MPEP 2143

There is clearly no suggestion or motivation to modify the references in the combination made by the Examiner. The references specifically teach away from such a combination. The Examiner asserts that Gorrie “shows a quadrature hybrid circuit comprising well-known generic baluns but does not show specific inductors.” While Applicant disagrees that Gorrie shows “a quadrature hybrid circuit comprising well-known generic baluns” (because a quadrature hybrid circuit does not comprise baluns), Applicant agrees that Gorrie shows a circuit containing a prior art quadrature hybrid (see 66 and 80 of Fig. 4). The Examiner further asserts that Maurant “shows a specific well-known art-recognized equivalent balun comprising the plurality of spiral inductors and insulating layer between the first and second spiral inductors (best illustrated in Fig. 2AA...)”, and that it would have been obvious to one of ordinary skill in the art at the time the invention was made to have substituted the well-known generic baluns disclosed by Gorrie with the balun disclosed by Maurant.

Applicant disagrees with this assertion. Mourant clearly states that the proposed configuration shown in Fig. 2A is not a well-known equivalent in the art. Mourant actually discloses the circuit of Fig. 2A as a failed experiment and expressly suggests that such a circuit is undesirable. Mourant, at col. 4, lines 18-23, states that the balun configuration that the Examiner asserts should be combined with Gorrie “does provide a high frequency path between the primary and secondary windings” and “does not provide a desirable level of isolation for common mode signals.” Mourant expressly teaches away from using a configuration as shown in Fig. 2A. Rather, Mourant teaches configuring the spiral inductors as shown in Fig. 4A, which is clearly distinct from the inductors used in the quadrature hybrid of the present invention, because the circuit of Fig. 2A will not work.

As a result, there is certainly no suggestion or motivation in Mourant to lead one to combine the portions cited by the Examiner with the teachings of Gorrie. Additionally, there is no reasonable expectation of success from the Examiner’s suggested combination, as the text of Mourant teaches the opposite, i.e., that one could reasonably expect the inductor configuration shown in Fig. 2A to be unsuccessful for the reasons cited in col. 4.

Because the required suggestion or motivation to combine the references is lacking, and there is no reasonable expectation of success, the Examiner has failed to set forth a prima facie case of obviousness. As a result, all of the rejections under 35 U.S.C. § 103 should be withdrawn.

Specific claim rejections

Claim 2

The Examiner has rejected claim 2 as unpatentable over Mourant in view of Gorrie. Applicant has amended claim 2 to read as follows:

2. A circuit functioning as a quadrature hybrid comprising;
 - a first spiral inductor and a second spiral inductor;
 - a first output and a second output,
 - an insulating layer disposed between said first spiral inductor and said second spiral inductor, wherein said first spiral inductor and said second spiral inductor and said insulating layer are positioned relative to each other to create an intrinsic capacitance, *said intrinsic capacitance selected in relation to said first and second inductors to cause said second output to be approximately ninety degrees different in phase to said first output.*

Claim 2, as amended, recites a quadrature hybrid having a first and second output, with the first and second outputs differing in phase by approximately ninety degrees. This configuration was previously claimed in claims 4, which has been canceled. The Examiner has not rejected claim 4; however, claim 4 was not included on the list of claims indicated as allowable.

Neither of the references, individually or in combination, teaches this configuration. Even if there was some proper way to combine Gorrie and Mourant, it certainly would not suggest selecting an intrinsic capacitance so as to achieve a 90 degree phase differential between the two outputs. Specifically, the entire focus of Mourant is to eliminate the intrinsic capacitance. Therefore, Mourant obviously cannot suggest an intrinsic capacitance to achieve a 90 degree phase differential. Gorrie, of course, does not teach intrinsic capacitance at all, and, thus, also does not teach this claim limitation.

In addition, Mourant teaches building balun transformers using a substantially flat primary and secondary conductive loops configured in spiral patterns. Balun transformers have outputs that differ in phase by 180 degrees. Gorrie uses quadrature hybrids in accordance with the prior art. Neither Gorrie nor Mourant teach a quadrature hybrid comprising spiral inductors with outputs that differ in phase by 90 degrees. Because the references do not teach or suggest all of the limitations of claim 2, the rejection should be withdrawn. As a result, claim 2, as amended, is now in condition for allowance.

Claims 3 and 5-10

Claims 3 and 5-10 depend from claim 2, and thus are allowable for the same reason as claim 2.

Claim 12

The Examiner has rejected claim 2 as unpatentable over Mourant in view of Gorrie. Specifically, the Examiner has asserted that Mourant and Gorrie teach the quadrature hybrid circuit comprising two quadrature hybrids and a plurality of terminating elements. Neither Mourant nor Gorrie, however, disclose the configuration of the present invention. Applicant has amended claim twelve to read as follows:

12. A circuit for performing vector modulation, said circuit encapsulated within a chip scale package, comprising:

an MMIC, said MMIC comprising:

an input quadrature hybrid;

an output power combiner;

a first quadrature hybrid and a second quadrature hybrid,

wherein said first and said second hybrids each comprise:

a first spiral inductor and a second spiral inductor;

an insulating layer disposed between said first spiral inductor and said

second spiral inductor, wherein said first spiral inductor and said

second spiral inductor and said insulating layer are positioned relative

to each other to create an intrinsic capacitance; and

a plurality of terminating elements.

Claim 12, as amended, incorporates the elements previously contained in claim 17, which the Examiner has indicated is allowable. Claim 17 has been deleted. Specifically, amended claim 12 recites a vector modulator circuit having an input quadrature hybrid, a first and second quadrature hybrid designed to create intrinsic capacitances, and an output power combiner. Neither Mourant nor Gorrie, nor a combination of the two, teaches or suggests this configuration. Accordingly, claim 12 is now in condition for allowance.

Claim 14-16, 18-21, and 23-24


Claims 14-16, 18-21, and 23-24 depend from claim 12, and thus are allowable for the same reason as claim 12

CONCLUSION

Independent claims 2 and 12 are currently in condition for allowance. All remaining pending claims depend from either claim 2 or claim 12. Thus, pending claims 2, 3, 5-10, 12, 14-16, 18-21, and 23-24 are currently in condition for allowance. Applicant respectfully requests reconsideration and issuance of the subject application. If any issues remain that preclude issuance of this application, the Examiner is urged to contact the undersigned attorney.

Respectfully Submitted,

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Date



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